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REMARKSI. Introduction

In response to the Office Action dated April 5, 2007, claims 3, 14, and 25 have been cancelled and claims 1, 4-12, 15-24, and 26-33 have been amended. Claims 1, 2, 4-13, 15-24, and 26-33 remain in the application. Re-examination and re-consideration of the application, as amended, is requested.

II. Allowable Subject Matter

In paragraph 5, the Office Action indicates that the subject matter of claims 4, 15, and 26 would be allowable if written in independent form including all of the limitations of the base claim and any intervening claims. The Applicants acknowledge the Office Action's indication of allowable subject matter, but traverse the rejection of claims the remaining claims. Should the rejection of these claims be maintained, the Applicants will make suitable amendments to present the allowable claims in independent form.

III. Claim Amendments

Applicants' attorney has made amendments to the claims as indicated above. The Applicants are not conceding in this application that those claims are not patentable over the art cited by the Examiner, as the present claim amendments and cancellations are only for clarifying the language of the claims and facilitating expeditious prosecution of the allowable subject matter. Applicants respectfully reserve the right to pursue these and other claims in one or more continuations and/or divisional patent applications.

IV. Examiner Interview

Reference is hereby made to a telephone interview between Applicants' attorney Victor G. Cooper and Examiner Christine M. Behncke on July 2, 2007, in which the patentability of claim 3 over the cited art was discussed. No agreement was reached.

V. The Cited References and the Subject Invention

A. The Kazimi Reference

U.S. Patent No. 6,311,929, issued November 6, 2001 to Kazimi et al. disclose a spacecraft and appendage stepping methods that improve spacecraft attitude pointing and cancel solar array slew disturbances. The Kazimi reference discloses a spacecraft having a body, one or more appendages coupled thereto, and a controller that implements methods that rotate the one or more flexible appendages to point it (them) towards the Sun to reduce spacecraft attitude pointing disturbances and improves spacecraft attitude pointing. The steps of the one or more appendages are timed to deadbeat the disturbance imparted to the spacecraft body. Timing of the appendage steps may be such that the periodic disturbances are phased to substantially cancel each other, or phased to decrease the magnitude of the net disturbance. The present invention also cancels solar array slew disturbances. The present invention cancels predictable disturbance torques before they produce a pointing error, improving the spacecraft pointing performance. The present invention predicts a disturbance torque exerted on the body due to the controller moving the one or more appendages, calculates a feedforward torque necessary for the controller to cancel the disturbance torque and includes the feedforward torque in the calculation of the total control torque applied to the body.

B. The Bizjak Reference

U.S. Publication No. 2003/0098805, published May 29, 2003 to Bizjak discloses an input level adjust system and method. A method of matching input amplitudes in a system wherein one or more of a plurality of inputs may be selected, with each input capable of having different characteristics, involving selecting an input signal and mapping the input signal to a predetermined signal amplitude through the use of level matching logic. The level matching logic may include a gain cell for increasing or decreasing the amplitude of the input signal.

VI. Office Action Prior Art Rejections

In paragraph (3), the Office Action rejected claims 1, 3, 5-8, 11, 12, 14, 16-19, 22, 23, 25, 27-30, and 33 under 35 U.S.C. § 102(b) as anticipated by Kazimi et al., U.S. Patent No. 6,311,929 (Kazimi). The Applicant respectfully traverses these rejections.

With Respect to Claim 1: As amended, claim 1 recites the features of claim 3 (now canceled) as follows:

A method of controlling a plurality of solar panels coupled to a spacecraft, comprising the steps of:
providing a first step command to a first solar panel comprising the steps of
computing a first solar panel angular command; and
providing the computed first solar panel angular command to a first solar panel driver; and
providing a second step command to a second solar panel at a time of a transient zero-crossing of a
dynamic response of the spacecraft body to the first step command, comprising the steps of
computing a second solar panel angular command;
biasing the computed second solar panel angular command by a transient cancellation bias
angle;
providing the biased second solar panel angular command to a second solar panel driver;
and
wherein the second solar panel is disposed on an opposite side of the spacecraft from the first solar
panel.

According to the Office Action, the step of biasing the computed second solar panel angular command by a transient cancellation bias angle is disclosed as follows:

Referring to FIG. 2, it illustrates details of a first exemplary method 20 in accordance with the principles of the present invention for controlling solar array wings 12, 13 to provide sun tracking. The method 20 is used with a spacecraft 10 having a body 11 with North and South solar array wings 12, 13 coupled thereto by way of servo controlled stepping mechanisms 14, and a controller 15 coupled to the servo controlled stepping mechanisms 14 that is used to rotate the solar array wings 12, 13 to point them towards the sun. The method 20 is as follows.

The Applicants respectfully disagree. As far as the Applicants can ascertain, the foregoing does not disclose biasing a solar panel angular command by a transient cancellation bias angle, or anything equivalent. In the telephonic discussion with Examiner Bechnke, it was suggested that the "transient cancellation bias" recited in claim 3 may be broadly and reasonably interpreted refer to a "temporal bias" and not an angular bias. The Applicants have amended the claim to clarify that the bias is angular, not temporal.

Independent claims 11, 12, 22, 23, and 33 recite analogous features and are patentable for the same reasons.

In paragraph (4), the Office Action rejected claims 9, 10, 20, 21, 31, and 32 under 35 U.S.C. §103(a) as being unpatentable over Kazimi in view of Bizjak, U.S. Publication No. 2003/0098805 (Bizjak).

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Claim 9 recites:

*The method of claim 1, wherein:
the step of providing a first step command to the first solar panel further comprises the step of
quantizing the first solar panel angular command;
the step of biasing the computed second solar panel angular command by a transient cancellation bias
angle comprises the steps of
quantizing the second solar panel angular command;
computing a modified solar panel angular command at least in part from the sum of the
quantized second solar panel angular command and the transient cancellation bias angle.*

According to the Office Action, the foregoing is unpatentable under 35 U.S.C. § 103(a) because Bizjak teaches that it is "well known in the art at the time of the invention to use an integrated circuit to create a delay/bias in the signal" and that "It would have been obvious to one of ordinary skill in the art to use a delay integration circuit to create the panel bias" and to "quantize to a least significant bit equal to a step size and to a value of a nearest step to control a commonly used stepper motor in a satellite."

The cited portion of the Bizjak reference recites:

[0459] For at least some embodiments, the characteristics of a useful response to changes in the noise floor signal are as follows: When changes in the noise signal occur, the initial response should be to delay, typically by a delay timer or by integrating the signal. If the change in the noise signal is longer lasting, then there should be a quick convergence on the proper noise floor, preferably with increasing exponential response for attack, and decreasing exponential response for release.

Bizjak discloses an input level adjustment system, and does not appear to be relevant to the Applicant's invention at all. The foregoing passage refers to handling a noisy signal by delaying it or integrating it. The Applicant does not understand how the foregoing is relevant to claim 9. Claim 9 does not recite a panel bias (nor does the cited portion of Bizjak). Like Kazimi, Bizjak also does not recite the use of a transient cancellation bias angle.

VII. Dependent Claims

Dependent claims 2, 4-10, 13, 15-21, 24, and 26-32 incorporate the limitations of their related independent claims, and are therefore patentable on this basis. In addition, these claims recite novel elements even more remote from the cited references. Accordingly, the Applicants respectfully request that these claims be allowed as well.

VIII. Conclusion


In view of the above, it is submitted that this application is now in good order for allowance and such allowance is respectfully solicited. Should the Examiner believe minor matters still remain that can be resolved in a telephone interview, the Examiner is urged to call Applicants' undersigned attorney.

Respectfully submitted,

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